



**Energy Efficiency and Renewable Energy  
Federal Energy Management Program**

# How to Buy an Energy-Efficient Gas Water Heater

## Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR<sup>®</sup> product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire US market towards greater energy efficiency, while saving taxpayer dollars.

## For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.  
Phone: (800) 363-3732  
[www.eere.energy.gov/femp/procurement](http://www.eere.energy.gov/femp/procurement)
- American Council for an Energy-Efficient Economy (ACEEE) publishes the *Consumer Guide to Home Energy Savings*.  
Phone: (202) 429-0063  
[www.aceee.org](http://www.aceee.org)
- *Home Energy* magazine provides energy conservation tips on water heating.  
Phone: (510) 524-5405  
[www.homeenergy.org](http://www.homeenergy.org)
- The Gas Appliance Manufacturers Association (GAMA) publishes the *Consumer's Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment*. This directory is available at:  
[www.gamanet.org](http://www.gamanet.org)
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.  
Phone: (202) 646-7950

## Efficiency Recommendation

Storage-Type (Rated Volume)	Recommended		Best Available	
	Energy Factor <sup>a</sup>	Annual Energy Use <sup>b</sup> (therms/year)	Energy Factor	Annual Energy Use (therms/year)
50 gallons or less	0.62	242	0.85	176

a) Energy Factor is an efficiency ratio of the energy supplied in heated water divided by the energy input to the water heater.

b) Based on DOE test procedure, see 10 CFR 430, Sub-Part B, Appendix E.

The federal supply sources for gas water heaters are the General Services Administration (GSA) and the Defense Logistics Agency (DLA). GSA sells water heaters through its Multiple Awards Schedule program and online shopping network, *GSAAAdvantage!* DLA sells them through the Defense Supply Center Philadelphia and online through *DoD EMall*. Whether purchasing water heaters from GSA, DLA or a commercial source check the yellow EnergyGuide label to find models that meet the recommended Annual Energy Use (therms/year). In solicitations and contracts, specify an Energy Factor (EF) that meets this efficiency recommendation.

## Where to Find Energy-Efficient Gas Water Heaters

Storage-type water heaters are the most commonly used products, but also the least efficient. They keep tanks full of water heated at all times which causes them to have high standby losses. Demand-type or instantaneous products heat water as it is being used, substantially reducing standby losses and increasing efficiencies. Some demand-type products can provide a sufficient amount of hot water for a whole house. However, in older homes the gas supply lines may be too small for these large demand-type products. Very large homes may need more than one instantaneous water heater to meet demand satisfactorily.

## Water Heating Options

Depending on climate and energy costs, solar-assisted water heaters may be cost effective. Other efficient options include indirect water heaters, which are connected to a home's boiler or integrated systems, which are large water heaters that also provide space heating. However, these options require additional analysis and design to work properly.

Water heaters must be sized properly. Over-sized water heaters not only cost more but increase energy use due to excessive cycling and higher standby losses. ACEEE's *Consumer Guide* and GAMA *Consumer Directory* (see "For More Information") provide guidance on proper sizing. A water heater should be selected based on first-hour rating (FHR), not tank size. Some water heaters with small tanks and large burners have higher FHRs and are more efficient than models with larger tanks. When installing a storage-type product, select the smallest possible water heater that meets the FHR and this recommendation. In situations where a large water heater is required (FHR of 100 gallons or more), it may be preferable to install two smaller units. For example, two 40 gallon water heaters (min. EF = 0.59) provide as much hot water during the first hour as a 100 gallon unit (min. EF = 0.48).

Energy use increases with water temperature. Dishwashers require the hottest water of all household uses, typically 135°F. However, these devices are usually equipped with booster heaters to increase water temperature by 15° to 20°F. Setting the water heater at 120°F and turning the dishwasher's booster on should provide sufficiently hot water.

## Sizing and Temperature Setting

### Gas Water Heater Cost-Effectiveness Example (40 gallon storage-type, 70 gallon First Hour Rating)

Performance	Base Model	Recommended Level	Best Available
Energy Factor	0.59	0.62	0.85
Annual Energy Use	254 therms	242 therms	176 therms
Annual Energy Cost	\$152	\$145	\$106
Lifetime Energy Cost	\$1,650	\$1,575	\$1,150
Lifetime Energy Cost Savings	–	\$75	\$500

#### Definition

*Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed water heater life of 13 years. Future gas price trends and a discount rate of 3.0% are based on federal guidelines (effective from April, 2004 to March, 2005).*

### Cost-Effectiveness Assumptions

The base model is a 40 gallon storage type water heater with an EF of 0.59 (which just meets the current US DOE appliance standard). The recommended model is a 40 gallon storage type with an EF of 0.62 and the best available is a demand-type water heater with a flow rate of 4.0 gallons per minute (at a 70°F temperature rise) and an EF of 0.85. Annual energy use in this example is based on the standard DOE test procedure and calculated assuming an inlet water temperature of 58°F, a setpoint of 135°F, daily hot water demand of 64 gallons, and 365 days per year of use. The assumed gas price is 60¢ per therm, the average gas price for federal facilities in the US.

### Using the Cost-Effectiveness Table

In the example above, the recommended water heater is cost-effective if its purchase price is no more than \$75 above that of the Base Model. The Best Available model is cost-effective if its installed cost is no more than \$500 above the Base Model.

### What if my Gas Price is different?

To calculate Lifetime Energy Cost Savings for a different gas price, multiply the savings by this ratio:  $\left( \frac{\text{Your price in ¢/therm}}{60.0 \text{ ¢/therm}} \right)$ .

#### Metric Conversions

1 gallon = 3.8 liters  
 1 therm = 100,000 Btu  
               = 29.3 kWh  
               = 105.5 MJ  
 $^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$

